

RELATION BETWEEN PHYSICAL EDUCATION QUALITY AND TEACHERS' COMMUNICATION STYLE – DIFFERENTIAL ANALYSIS

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Abstract: The conducted research was focused on the communication aspect of the implementation of Physical Education (PE) with the main goal of determining the influence of different communication dimensions on the implementation quality of individual parts of the lesson. The sample of respondents consisted of 120 student teachers of kinesiology, who taught classes with upper primary school students. Data on teaching quality and communication modality were collected using the direct observation method with the application of the Questionnaire for the assessment of the teaching process quality (QT) and Questionnaire for the evaluation of interpersonal communication modality (QC). The influence of communication dimensions on the quality of individual parts of the PE lesson was determined by applying a series of regression analyses. The obtained findings confirmed the significant relations between the communication dimensions and the implementation quality of all lesson parts. The size of the relations grew with the increase in the duration and complexity of the individual lesson part, where the main parts of the lesson, in which the learning and teaching of more complex kinesiology content and the application of different methods and methodical organizational forms of work come to the fore, required more pronounced communication skills. The research confirmed the importance of quality communication in teaching with special emphasis on the need to develop these skills in future teachers, as a prerequisite for quality work in all aspects of the educational process.

Keywords: PE lesson; lesson articulation; educational communication; primary school children.

INTRODUCTION

Every human activity, no matter how complex it may be and no matter how chaotic and unpredictable it may seem at first glance, follows a certain course that has a kind of regularity in its internal genesis. So, although the number of degrees of freedom in such activities is practically infinite, and therefore the number of possible directions in its development is infinite as well as the number of outcomes, still in this case we are dealing with a system of deterministic chaos. Also, it is important to bear in mind the fact, and the same is confirmed by practice, that the educational process is a complex system (Bilić et al., 2005; Findak et al., 2003; Findak & Prskalo, 2003; Vlahović et al., 2015, 2020), which is very difficult to manage and keep under control. As stated in the introductory remarks, the teaching process can be viewed as a communication process between its main subjects, teachers and students. In this way, the teaching process is defined as a process of exchanging information, i.e. transferring content and defining interpersonal relationships between teaching subjects, through interpersonal communication.

Taking into account that the quality of the educational process depends on the quality of the established relationships between its participants, and since these are formed through the processes of pedagogical communication, it is crucial to define optimal communication models by establishing a balance of its dimensions in order to improve the teaching process (Lorger et al., 2013). Education is described (in the broader sense of the word, A/N) as an interaction-communicative process, thus locating it in the field of interpersonal relations (Bratanić, n.d.). The author refers to the definition of Malić and Mužić, who define educational activity as a communication process in which subjects interact with each other, with the basic purpose of influencing the development of children (Malić & Mužić, 1983). Communication itself in the process of education is understood, in this context, as a process of creating meaning between two or more persons (Bratanić, n.d.). Some authors defined positive linear relationships between the teacher's non-verbal and verbal directness and cognitive, affective and imitative learning as well as the level of motivation crucial for learning (Christensen & Menzel, 1998). It is possible to conclude that a successful educational process requires the establishment of quality communication between subjects. Obviously, pedagogical communication takes place both on an intraper-

sonal, interpersonal and social level. In fact, the success of educational activity will depend to the greatest extent on the quality of interaction and the degree of interactional connection in the communication of all its participants (Bratanić, n.d.). It is clear, therefore, that the educational process can only be successful within the context of quality communication, so the question arises: “How do we communicate with students and is such communication a prerequisite for a successful educational process?” (T. Bavčević et al., 2005). This is precisely where the key to optimizing the education process as a whole lie. In this research, the analysis of the quality of the teaching process focused on the individual PE lesson, since it represents the basic formative unit of the education process in all areas, including kinesiology (Androja et al., 2023; D. Bavčević et al., 2022; T. Bavčević et al., 2006; Prskalo et al., 2010). Therefore, the teacher’s success in teaching as well as the realization of learning outcomes depends directly on the organization and realization of the lesson itself (Androja et al., 2020; Feito et al., 2018; Findak et al., 2011; Pejčić et al., 2021; Prskalo et al., 2010). In accordance with the didactical articulation, the Physical Education lesson lasts 45 minutes in total, and includes five successive parts, namely: Introductory lesson part, Preparatory lesson part, Main A and B lesson part and Closing lesson part.

The aim of this research was to analyse the communication aspects of Physical Education as generative factors in the educational process. The influence of the communication dimensions on the implementation quality of the individual lesson parts was examined in particular.

MATERIALS AND METHODS

Study design and participants

The research included 120 participants, of which 55 were female students and 65 male students of the Faculty of Kinesiology, University of Split, Republic of Croatia. The students involved in the research previously passed the General kinesiological didactics course and underwent a professional-pedagogical practice in Physical education in primary and secondary schools lasting fifteen days. The respondents joined the project voluntarily after being informed about the subject of the research and the examination procedure.

Data collection

In order to determine the quality of the implementation of the PE teaching process, the *Questionnaire for the assessment of the teaching process quality (QT)* was applied (T. Bavčević, 2010). The questionnaire consists of 20 qualitative parameters divided into five groups according to the articulation of the PE lesson: *Quality of introductory lesson part (ILP)*, *Quality of preparatory lesson part (PLP)*, *Quality of main A lesson part (MALP)*, *Quality of main B lesson part (MBLP)*, *Quality of closing lesson part (CLP)*. In this way, each part of the lesson was evaluated with four grades on a five-point Likert scale, where the grades value the quality of the organization of the teaching process, the quality (adequacy) of the teaching content, the quality of the presentation of the teaching content, and the quality of the realization of the teaching content. Questionnaire *QT* is available as supplementary file S1.

The evaluation of interpersonal communication modality in the teacher/student-student relationship was carried out using the *Questionnaire for the evaluation of interpersonal communication modality (QC)*. The questionnaire includes 27 communication parameters, divided into three groups according to communication dimensions defined as *Technical and content communication dimension (TCD)*, *Assertiveness and formality dimension (AFD)* and *Emphatic and closeness dimension (ECD)*. In this way, each of the dimensions was evaluated with nine points using a five-point Likert scale. Questionnaire *QC* is available as supplementary file S2.

The research was conducted in a primary school in the city of Split, Croatia, where students of kinesiology conducted PE lessons with fifth-grade students as part of the Kinesiological didactics course.

Data on the teaching process quality, as well as on the modalities of interpersonal communication, were collected by the method of direct observation of students’ lectures and evaluation of the defined parameters using evaluation questionnaires by five evaluators, graduated kinesiologists. The evaluators were familiarized with the evaluation parameters and methodology before participating in the examination procedure.

The research is part of the research project “*The integrative and developmental role of kinesiological education in the educational system – facing the challenges of modern schooling*” approved by the Faculty Council of the Faculty of Kinesiology, University of Split (No.: 2181-205-02-01-23-0166, 15 December 2023). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data analysis

Descriptive statistics parameters were calculated on the collected data, including the following indicators: mean (M), minimum result (min), maximum result (max), standard deviation (SD), skewness (α_3), kurtosis (α_4). Testing the normality of the data distribution was performed using the Kolmogorov-Smirnov test (KS-test). As part of the testing, the maximum deviation between the empirical and theoretical relative cumulative frequency (max d) was calculated. By comparing this parameter with the critical value of the KS-test (d) for the corresponding number of respondents at the error level of 0.05, the shape of the distribution was determined. In order to determine the dependence of particular dimensions of the teaching process in relation to the dimensions of the interpersonal communication process as an independent set of predictors, a multiple regression analysis was applied. As part of the analysis, the following parameters were calculated: multiple correlation coefficient (R), coefficient of determination (R^2), standard error of prediction (σ_e), F-test value (F), standardized regression coefficient (β), coefficient of linear correlation (r), t-test value (t), significance level for F-test and t-test (p). The software STATISTICA v.14.0.1.25 was used for data processing (TIBCO Software Inc, USA).

RESULTS

Table 1 shows the parameters of descriptive statistics and the Kolmogorov-Smirnov test of normality of data distribution for the subsample of female students.

Table 1. Parameters of descriptive statistics and KS-test, female students.

	M	min	max	SD	α_3	α_4	max d
ILP	3.94	2.50	4.95	0.65	-0.10	-1.04	0.101
PLP	3.65	2.00	4.65	0.63	-0.61	-0.10	0.090
MALP	3.72	2.35	4.85	0.63	-0.22	-0.71	0.080
MBLP	3.60	1.35	4.85	0.87	-0.73	-0.05	0.115
CLP	3.96	1.90	5.00	0.69	-0.93	0.69	0.128
TCD	3.87	2.33	4.78	0.65	-0.74	-0.38	0.142
AFD	3.52	2.33	4.80	0.50	-0.33	0.34	0.113
ECD	3.48	2.51	4.38	0.49	-0.15	-0.77	0.066

Note: Critical KS-test value ($p < 0.05$; $n = 55$) = 0.180.

The mean values of the teaching process variables range from 3.65 to 3.96 with a standard deviation of 0.63 up to 0.87. In the set of interpersonal communication process variables, the mean values range from 3.48 to 3.87 with standard deviations from 0.49 to 0.65. After conducting the K-S test, a normal distribution was determined for all tested variables.

Table 2. Parameters of descriptive statistics and KS-test, male students.

	M	min	max	SD	α_3	α_4	max d
ILP	3.61	1.70	4.90	0.90	-0.25	-1.31	0.137
PLP	3.33	2.00	4.90	0.67	0.32	-0.56	0.074
MALP	3.61	2.65	4.95	0.57	0.26	-0.75	0.092
MBLP	3.51	1.35	4.90	0.81	-0.37	-0.56	0.083
CLP	3.79	2.25	4.90	0.73	-0.51	-0.65	0.095
TCD	3.65	2.38	4.73	0.54	-0.00	-0.47	0.064
AFD	3.33	2.56	4.58	0.45	0.31	-0.34	0.072
ECD	3.34	1.82	4.33	0.53	-0.24	0.06	0.087

Note: Critical KS-test value ($p < 0.05$; $n = 65$) = 0.166.

Table 2 shows the parameters of descriptive statistics and the Kolmogorov-Smirnov test of normality of data distribution for the subsample of male students.

The mean values of the teaching process variables range from 3.33 to 3.79 with a standard deviation of 0.57 up to 0.90. In the set of interpersonal communication process variables, the mean values range from 3.33 to 3.65 with standard deviations from 0.45 to 0.54. After conducting the K-S test, a normal distribution was determined for all tested variables.

In order to determine the linear dependence between the dimensions of the teaching process and the process of interpersonal communication, a correlation analysis was applied. Table 3 shows the intercorrelations matrix between the two sets of variables, separately for female and male students.

Table 3. Intercorrelations matrix, female and male students.

	Female			Male		
	TCD	AFD	ECD	TCD	AFD	ECD
ILP	0.34	0.23	0.41	0.62	0.43	0.57
PLP	0.45	0.52	0.42	0.68	0.55	0.76
MALP	0.74	0.70	0.58	0.74	0.64	0.73
MBLP	0.67	0.53	0.50	0.64	0.50	0.55
CLP	0.66	0.46	0.51	0.48	0.32	0.44

Correlation analysis for the subsample of female students indicated, in general, the existence of a positive correlative connection between the variables of the teaching process and the variables of interpersonal communication. The mentioned connections range from weak ($r = 0.23$) to medium strong ($r = 0.74$) correlations. Similar results were recorded in the sub-sample of male students. The values of Pearson's linear correlation coefficients are thus in the range from weak ($r = 0.32$) to medium strong ($r = 0.76$) correlation. In order to determine the relations between the dimensions of the teaching process and the dimensions of interpersonal communication as an independent set of predictors, a multiple regression analysis was applied. Table 4 shows the results of the multiple regression analysis for the criterion variable *Quality of introductory lesson part (ILP)*, separately for female and male students.

Table 4. Multiple regression analysis; criterion variable - *Quality of introductory lesson part (ILP)*.

	Female				Male			
	Multiple regression							
	R = 0.424	R ² = 0.180	$\sigma_e = 0.601$		R = 0.638	R ² = 0.407	$\sigma_e = 0.708$	
	F = 3.734	p = 0.017			F = 13.983	p < 0.001		
	β	r	t	p	β	r	t	p
TCD	0.00	0.34	0.02	0.98	0.46	0.62	2.62	0.01
AFD	0.11	0.23	0.67	0.50	0.00	0.43	0.02	0.99
ECD	0.37	0.41	1.98	0.05	0.21	0.57	1.33	0.19

The results of the multiple regression analysis for the subsample of female students indicate a significant level of relation between the predictor set and the variable *Quality of introductory lesson part (ILP)*. The multiple correlation coefficient ($R = 0.424$) confirms that a significant part of the variability of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 3.734$; $p = 0.017$), so it is possible to consider the model as predictively valid. The value of the coefficient of determination ($R^2 = 0.180$) indicates a statistically significant amount of common variance of the predictor set and the criterion variable. The value of the standard error of the prediction ($\sigma_e = 0.601$), as an indicator of the standard deviation of the dispersion of the measured results around the regression line, indicates a satisfactory degree of representativeness of the regression model. The analysis of the partial influence of individual variables did not indicate a

statistically significant contribution of any of the three variables of the predictor set on significance of the regression model. The obtained values of the standardized regression coefficients are not significant (β : [0.00, 0.37]), and the values of the linear correlation coefficients of individual predictor variables and criteria are in the interval of weak correlation (r : [0.23, 0.41]). The obtained findings were confirmed using *t-test* (t : [0.02, 1.98]; p : [0.05, 0.98]). The results of the multiple regression analysis for the subsample of male students indicate a significant relation between the predictor set of variables and the criterion variable *Quality of introductory lesson part (ILP)*. The coefficient of multiple correlation ($R = 0.638$) shows that a significant amount of the variance of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 13.983$; $p < 0.001$), which points to the conclusion that the defined set of predictors enables a valid prediction of the value of the criterion variable. The coefficient of determination ($R^2 = 0.407$) indicates a significant amount of common variance of the predictor set of variables and the criterion variable. The obtained value of the standard error of the prediction ($\sigma_e = 0.708$) indicates a satisfactory degree of representativeness of the defined regression model. The analysis of the partial influence of individual variables of the predictor set indicated a statistically significant contribution of the variable *Technical and content communication dimension (TCD)* to the validity of the regression model. The value of the standardized regression coefficient ($\beta = 0.46$) indicates a significant influence of the observed variable on the criterion values. The mentioned variable has a moderately strong correlative relationship with the criterion variable ($r = 0.62$). The stated results were confirmed using the *t-test* ($t = 2.62$; $p = 0.01$).

Table 5 shows the results of the multiple regression analysis for the criterion variable *Quality of preparatory lesson part (PLP)*, separately for female and male students.

Table 5. Multiple regression analysis; criterion variable - *Quality of preparatory lesson part (PLP)*.

	Female				Male			
Multiple regression	$R = 0.588$	$R^2 = 0.346$	$\sigma_e = 0.523$		$R = 0.777$	$R^2 = 0.604$	$\sigma_e = 0.431$	
	$F = 8.998$	$p < 0.001$			$F = 31.065$	$p < 0.001$		
	β	r	t	p	β	r	t	p
TCD	-0.05	0.45	-0.27	0.79	0.16	0.68	1.11	0.27
AFD	0.45	0.52	3.11	0.00	0.12	0.55	1.07	0.29
ECD	0.32	0.42	1.88	0.07	0.57	0.76	4.44	0.00

The obtained results of the multiple regression analysis for the subsample of female students indicate a significant relation between the predictor set and the variable *Quality of preparatory lesson part (PLP)*. The multiple correlation coefficient ($R = 0.588$) confirms that a significant amount of the variance of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 8.998$; $p < 0.001$), so it is possible to conclude that the defined set of predictors enables a valid prediction of the value of the criterion variable *Quality of preparatory lesson part (PLP)*. The coefficient of determination ($R^2 = 0.346$) indicates a satisfactory amount of common variance of the predictor set and the criterion variable. The value of the standard error of the prediction ($\sigma_e = 0.523$) indicates a satisfactory degree of representativeness of the defined regression model. The analysis of the partial influence of individual variables of the predictor set indicated a statistically significant contribution of the *Assertiveness and formality dimension (AFD)* variable to the significance of the regression model. The value of the standardized regression coefficient ($\beta = 0.45$) indicates a significant influence of the mentioned variable on the criterion values. The specified variable has a moderately strong correlative relationship with the criterion variable ($r = 0.52$). The obtained results were confirmed using the *t-test* ($t = 3.11$; $p < 0.01$). The results of the multiple regression analysis for the subsample of male students indicate a statistically significant relation between the predictor set of variables and the criterion variable *Quality of preparatory lesson part (PLP)*. The multiple correlation coefficient ($R = 0.777$) confirms that the variability of the criterion variable is significantly influenced by the variables of the predictor set, so the defined regression model can be considered predictively valid. The obtained findings were confirmed by the results of the *F-test* ($F = 31.065$; $p < 0.001$). The value of the coefficient of determination ($R^2 = 0.604$) indicates a significant amount of common variance of the predictor set and the crite-

tion variable. The standard error of the prediction ($\sigma_e = 0.431$) indicates a satisfactory degree of representativeness of the defined regression model. The analysis of the partial influence of individual variables indicated a statistically significant contribution of the variable *Emphatic and closeness dimension (ECD)* to the significance of the regression model. The value of the standardized regression coefficient ($\beta = 0.57$) indicates a significant influence of the specified variable on the value of the criterion variable. The analysis also revealed a medium-strong correlation between these two variables ($r = 0.76$). The statistical significance of the partial influence of the predictor variable was confirmed using the *t-test* ($t = 4.44$; $p < 0.01$). Table 6 shows the results of the multiple regression analysis for the criterion variable *Quality of main A lesson part (MALP)*, separately for female and male students.

Table 6. Multiple regression analysis; criterion variable - *Quality of main A lesson part (MALP)*.

	Female				Male			
Multiple regression	R = 0.817	R ² = 0.667		$\sigma_e = 0.372$	R = 0.797	R ² = 0.635		$\sigma_e = 0.355$
	F = 34.113	p < 0.001			F = 35.323	p < 0.001		
	β	r	t	p	β	r	t	p
TCD	0.35	0.74	2.44	0.02	0.28	0.74	2.05	0.04
AFD	0.43	0.70	4.13	0.00	0.24	0.64	2.29	0.03
ECD	0.19	0.58	1.60	0.12	0.37	0.73	3.02	0.00

The results of the multiple regression analysis for the subsample of female students indicate a statistically significant relation between the predictor set of variables and the criterion variable *Quality of main A lesson part (MALP)*. The multiple correlation coefficient ($R = 0.817$) confirms that the variability of the criterion variable is significantly influenced by the set of predictors. The aforementioned findings were confirmed using the *F-test* ($F = 34.113$; $p < 0.001$), so the defined regression model can be considered predictively valid. The value of the determination coefficient ($R^2 = 0.667$) indicates a significant amount of common variance of the predictor set and the criterion variable. The standard error of the prediction ($\sigma_e = 0.372$) indicates a satisfactory degree of representativeness of the regression model.

The analysis of partial influence indicated a significant contribution of two variables to the validity of the regression model. The value of the standardized regression coefficient for the variable *Assertiveness and formality dimension (AFD)* ($\beta = 0.43$) indicates a significant influence of the specified variable on the results of the criterion variable. The analysed predictor variable has a moderately strong correlation with the criterion ($r = 0.70$). The obtained findings were confirmed using the *t-test* ($t = 4.13$; $p < 0.01$). A statistically significant influence on the results of the criterion variable is also achieved by the variable *Technical and content communication dimension (TCD)*, which confirms the value of the associated standardized regression coefficient ($\beta = 0.35$). The observed predictor is moderately strongly correlated with the criterion variable ($r = 0.74$). The aforementioned findings were confirmed using the *t-test* ($t = 2.44$; $p = 0.02$). Multiple regression analysis for a subsample of male students indicates a statistically significant relation between the predictor set of variables and the criterion variable *Quality of main A lesson part (MALP)*. The value of the multiple correlation coefficient ($R = 0.797$) confirms that the variability of the criterion variable is significantly influenced by the variables of the predictor set. The obtained findings were confirmed using the *F-test* ($F = 35.323$; $p < 0.001$), which points to the conclusion about the predictive validity of the defined regression model. The coefficient of determination ($R^2 = 0.635$) indicates a significant amount of shared variance of the predictor set of variables and the criterion variable. The value of the standard error of the prediction ($\sigma_e = 0.355$) indicates a satisfactory degree of representativeness of the regression model. The analysis of the partial influence indicated a statistically significant contribution of all three variables of the predictor set on significance of the regression model. The variable *Emphatic and closeness dimension (ECD)* has the greatest partial influence on the values of the results of the criterion variable, which confirms the value of the associated partial regression coefficient ($\beta = 0.37$). The observed variable has a moderately strong correlation with the criterion variable ($r = 0.73$). The obtained findings were confirmed using the *t-test* ($t = 3.02$; $p < 0.01$). The variable *Technical and content communication dimension (TCD)* also has a statistically significant partial influence on the values of the results of the criterion variable, as indicated by the value of the

partial regression coefficient ($\beta = 0.28$). The mentioned variable is moderately strongly correlated with the criterion ($r = 0.74$). The findings were confirmed using the *t-test* ($t = 2.05$; $p = 0.04$). The value of the associated standardized regression coefficient ($\beta = 0.24$) shows that the results of the criterion variable are also significantly influenced by the third variable of the predictor set, the variable *Assertiveness and formality dimension (AFD)*. The observed variable has a moderately strong correlative relationship with the criterion ($r = 0.64$). The aforementioned findings were confirmed using the *t-test* ($t = 2.29$; $p = 0.03$).

Table 7 shows the results of the multiple regression analysis for the criterion variable *Quality of main B lesson part (MBLP)*, separately for female and male students.

Table 7. Multiple regression analysis; criterion variable - *Quality of main B lesson part (MBLP)*.

	Female				Male			
Multiple regression	R = 0.688	R ² = 0.474	$\sigma_e = 0.652$		R = 0.651	R ² = 0.424	$\sigma_e = 0.633$	
	F = 15.300	p < 0.001			F = 14.994	p < 0.001		
	β	r	t	p	β	r	t	p
TCD	0.48	0.67	2.66	0.01	0.46	0.64	2.66	0.01
AFD	0.21	0.53	1.64	0.11	0.11	0.50	0.81	0.42
ECD	0.09	0.50	0.57	0.57	0.13	0.55	0.87	0.39

The results of the multiple regression analysis for the subsample of female students indicate a statistically significant relation between the predictor set of variables and the criterion variable *Quality of main B lesson part (MBLP)*. The multiple correlation coefficient ($R = 0.688$) confirms that a significant part of the variability of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 15.300$; $p < 0.001$), so the defined regression model can be considered predictively valid. The value of the determination coefficient ($R^2 = 0.474$) indicates a significant amount of common variance of the predictor set and the criterion variable. The standard error of the prediction ($\sigma_e = 0.652$) indicates a satisfactory degree of representativeness of the regression model. The analysis of the partial influence of individual variables of the predictor set indicated a statistically significant contribution of the variable *Technical and content communication dimension (TCD)* to the validity of the regression model. The value of the standardized regression coefficient ($\beta = 0.48$) indicates a significant influence of the mentioned predictor on the value of the criterion variable. The specified variable has a moderately strong correlative relationship with the criterion variable ($r = 0.67$). The obtained findings were confirmed using the *t-test* ($t = 2.66$; $p = 0.01$). The findings of the multiple regression analysis for the subsample of male students indicate a statistically significant relation between the predictor set of variables and the criterion variable *Quality of main B lesson part (MBLP)*. The multiple correlation coefficient ($R = 0.651$) shows that a significant amount of the variance of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 14.994$; $p < 0.001$), which points to the conclusion that the defined set of predictors enables a valid prediction of the value of the criterion variable. The value of the coefficient of determination ($R^2 = 0.424$) indicates a significant amount of common variance of the predictor set of variables and criteria. The obtained value of the standard error of the prediction ($\sigma_e = 0.633$) indicates a satisfactory degree of representativeness of the defined regression model. The analysis of the partial influence of individual variables indicated a statistically significant contribution of the variable *Technical and content communication dimension (TCD)* to the significance of the regression model. The value of the standardized regression coefficient ($\beta = 0.46$) indicates a significant influence of the mentioned variable on the value of the criterion variable. Furthermore, the analysis established a medium strong correlation between the two mentioned variables ($r = 0.64$). The statistical significance of the partial influence of the predictor variable was confirmed using the *t-test* ($t = 2.66$; $p = 0.01$).

Table 8 shows the results of the multiple regression analysis for the criterion variable *Quality of closing lesson part (CLP)*, separately for female and male students.

Table 8. Multiple regression analysis; criteria variable - *Quality of closing lesson part (CLP)*.

	Female				Male			
Multiple regression	R = 0.666	R ² = 0.443	$\sigma_e = 0.530$		R = 0.494	R ² = 0.244	$\sigma_e = 0.653$	
	F = 13.528	p < 0.001			F = 6.552	p = 0.001		
	β	r	t	p	β	r	t	p
TCD	0.53	0.66	2.91	0.01	0.37	0.48	1.84	0.07
AFD	0.11	0.46	0.79	0.43	-0.02	0.32	-0.15	0.88
ECD	0.08	0.51	0.54	0.59	0.17	0.44	0.95	0.35

Multiple regression analysis for the subsample of female students indicates a statistically significant relation between the predictor set of variables and the criterion variable *Quality of closing lesson part (CLP)*. The value of the multiple correlation coefficient ($R = 0.666$) confirms that a significant amount of the variance of the criterion variable can be attributed to the influence of the predictor set of variables. The obtained findings were confirmed using the *F-test* ($F = 13.528$; $p < 0.001$), so the defined regression model can be considered predictively valid. The coefficient of determination ($R^2 = 0.443$) indicates a significant amount of shared variance of the predictor set of variables and the criterion variable. The value of the standard error of the prediction ($\sigma_e = 0.530$) indicates a satisfactory degree of representativeness of the regression model.

The analysis of the partial influence of individual variables of the predictor set indicated a statistically significant contribution of the variable *Technical and content communication dimension (TCD)* to the significance of the regression model. The value of the standardized regression coefficient ($\beta = 0.53$) indicates a significant influence of the mentioned predictor on the value of the criterion variable. The specified variable has a moderately strong correlative relationship with the criterion variable ($r = 0.66$). The obtained findings were confirmed using the *t-test* ($t = 2.91$; $p = 0.01$). The results of the multiple regression analysis for the subsample of male students indicate a statistically significant level of relation between the predictor set of variables and the variable *Quality of closing lesson part (CLP)*. The multiple correlation coefficient ($R = 0.494$) confirms that a significant part of the variability of the criterion variable can be attributed to the influence of the predictor set. The statistical significance of the regression model was confirmed using the *F-test* ($F = 6.552$; $p = 0.001$), so it is possible to conclude that the defined regression model enables a valid prediction of the results of the criterion variable. The coefficient of determination ($R^2 = 0.244$), despite the lower value, indicates a statistically significant amount of common variance of the predictor set and the criterion variable. The obtained value of the standard error of the prediction ($\sigma_e = 0.653$) indicates a satisfactory degree of representativeness of the defined regression model. The analysis of the partial influence of individual variables did not indicate a statistically significant contribution of any of the three variables of the predictor set on significance of the regression model. The obtained values of the standardized regression coefficients are not significant (β :[-0.02, 0.37]), and the values of the linear correlation coefficients of individual predictor variables and criteria are in the interval of weak correlation (r :[0.32, 0.48]). The obtained findings were confirmed by using *t-test* (t :[-0.15, 1.84]; p :[0.07, 0.88]).

DISCUSSION

By analysing the parameters of the correlation analysis, a significant positive correlation was recorded between all the variables of the teaching process and the process of interpersonal communication in both subsamples of respondents. The obtained values of correlation coefficients range from weak ($r_{\text{female}} = 0.23$; $r_{\text{male}} = 0.32$) to medium strong ($r_{\text{female}} = 0.74$; $r_{\text{male}} = 0.76$). It is possible to state that, on the general level, there is a positive connection between the quality of individual parts of the lesson and the manifestation of individual communication dimensions.

The aforementioned findings are clearly shown in Figure 1, separately for female and male student teachers. Also, the curve of the theoretical intellectual load in the PE lesson according to Fetz is superimposed on the graphs (Findak, 2003, p. 200). This allows us to create a general picture of the relationship between the level of influence of the communication dimensions on individual parts of the lesson with regard to their intellectual demands.

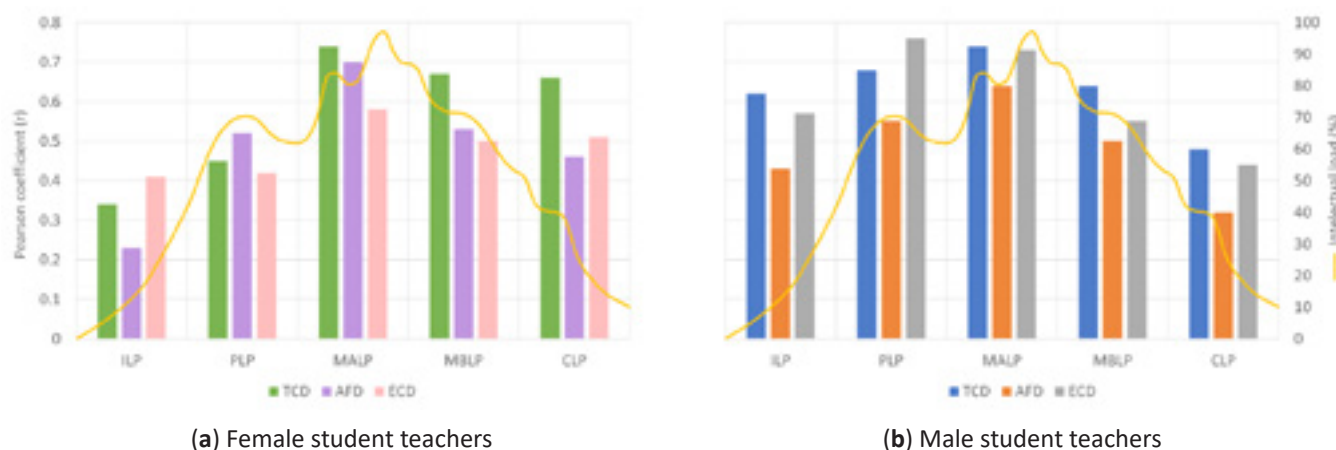


Figure 1. Correlation between quality of the lesson parts and communication dimension and theoretical intellectual load of PE lesson

Analysing the graphic representation, it is possible to see that the level of influence of communication dimensions basically follows the dynamics of the intellectual load in the PE lesson on both female and male student teachers. Of course, the presented conclusions must be treated with caution, since the correlation results outline the partial connection of the observed dimensions. Nevertheless, it is impossible not to notice how the parts of the lesson which, in terms of content and organization, represent a greater intellectual challenge, to a greater extent require better communication skills in order to optimize the educational effects.

Generally speaking, the connection of individual variables of the PE teaching process and the process of interpersonal communication at the level of correlation coefficients, as well as their relationship in the context of the theoretical model of intellectual load, points to the existence of complex interrelationships between the quality of the implementation of the teaching process and the dimensions of interpersonal communication. The obtained findings can be based on the research of other authors (T. Bavčević, 2012; García-Fariña et al., 2022).

The implementation quality of the introductory lesson part is significantly dependent on the manifestations of the interpersonal communication process dimensions, in both subsamples of respondents ($R_{\text{female}} = 0.424$; $F_{\text{female}} = 3.734$; $p_{\text{female}} = 0.017$; $R_{\text{male}} = 0.638$; $F_{\text{male}} = 13.983$; $p_{\text{male}} < 0.001$).

The analysis of the partial influence in the subsample of female students did not indicate a statistically significant contribution of any of the three variables. The obtained findings point to the conclusion that despite the existence of dependence at the general level, none of the defined dimensions partially significantly determines the quality of the implementation of this part of the PE lesson.

In the case of the male student subsample, a statistically significant contribution to the regression model is made by the variable *Technical and content communication dimension (TCD)* ($\beta = 0.46$; $t = 2.62$; $p = 0.01$). It is obvious that technically and qualitatively articulated communication significantly contributes to the quality of organization, presentation and implementation of the introductory lesson part. Considering the content that is applied in this part of the lesson, and especially the implementation methodology, the introductory lesson part primarily requires a high-quality explanation of the content with clearly defined rules and performance criteria. Therefore, the obtained findings are fully in accordance with the methodical articulation of this part of the PE (T. Bavčević et al., 2018).

The quality of the implementation of the preparatory lesson part is significantly dependent on the manifestations of interpersonal communication dimensions in both subsamples of respondents ($R_{\text{female}} = 0.588$; $F_{\text{female}} = 8.998$; $p_{\text{female}} < 0.001$; $R_{\text{male}} = 0.777$; $F_{\text{male}} = 31.065$; $p_{\text{male}} < 0.001$).

Analysing the results of the subsample of female students, a statistically significant partial contribution of the *Assertiveness and formality dimension (AFD)* variable to the significance of the regression model was observed ($\beta = 0.45$; $t = 3.11$; $p < 0.01$). It is possible to conclude that communication characterized by an increased degree of authoritarianism, determination in expressing views and positional fixation, i.e. communication asymmetry, has a positive impact on the success of the organization, presentation and implementation of the preparatory lesson part. The obtained findings are in accordance with the methodical articulation of this part of the lesson. The preparatory lesson part requires a clearly defined formation and a proper change of verbal explanation, demonstration of the content, and

implementation and control of the physical exercise process. It is obvious that female students who managed to create an appropriate communication climate were more successful in the implementation of this part of the PE lesson.

A partial analysis of the subsample of male students showed a significant contribution of the *Emphatic and closeness dimension (ECD)* variable to the significance of the regression model ($\beta = 0.57$; $t = 4.44$; $p < 0.01$). Communication based on openness, cooperation, mutual respect and a friendly communication climate significantly contributes to the quality of organization, presentation and realization of the preparatory lesson part. This leads to the conclusion that this modality of communication has a positive effect on the motivation and degree of student involvement in the exercise process.

The implementation quality of the main A lesson part is significantly dependent on the manifestations of the interpersonal communication process dimensions, in both subsamples of respondents ($R_{\text{female}} = 0.817$; $F_{\text{female}} = 34.113$; $p_{\text{female}} < 0.001$; $R_{\text{male}} = 0.797$; $F_{\text{male}} = 35.323$; $p_{\text{male}} < 0.001$).

Analysis of the partial influence in the subsample of female students indicated a significant contribution of two variables to the significance of the regression model. The variable *Assertiveness and formality dimension (AFD)* make the biggest contribution ($\beta = 0.43$; $t = 4.13$; $p < 0.01$). It is possible to conclude that communication characterized by an increased degree of authoritarianism, determination in expressing views and positional fixation, i.e. communication asymmetry, positively affects the implementation of the main A lesson part. Considering the high level of complexity in terms of content, exercise formations, methodical organizational forms of work as well as the overall methodology of implementation and control of work, quality implementation of this part of the class requires the establishment of such relationships. The size of the partial influence is followed by the variable *Technical and content communication dimension (TCD)* ($\beta = 0.35$; $t = 2.44$; $p = 0.02$). The obtained findings indicate the importance, in terms of content and technique, of well-articulated communication in the implementation of the main A lesson part. Since this part of the PE lesson involves learning and repeating the teaching topics provided by the curriculum, a high-quality verbal description and clarification of the content is a necessary prerequisite for its successful realization.

All of the above can be compared with the findings of other studies that dealt with the content and quality of the teaching process (T. Bavčević, 2015, 2016; Dyson, 2014; Genurianto et al., 2021).

In the male student subsample, a significant contribution of all three variables of the interpersonal communication process to the significance of the regression model was recorded. The greatest partial contribution is achieved by the variable *Emphatic and closeness dimension (ECD)* ($\beta = 0.37$; $t = 3.02$; $p < 0.01$). Communication marked by openness, cooperation, mutual respect and a friendly communication climate has a positive impact on the success of the organization, content presentation and implementation of the main A lesson part. Considering the content, organizational and implementation complexity, this part of the lesson requires a high degree of attention, motivation and active engagement of students (T. Bavčević et al., 2006, 2018; Pop, 2014). Kinesiology students who manage to create a stimulating communication climate are more successful in this part of the lesson. According to the size of the partial influence on the regression model, the variable *Technical and content communication dimension (TCD)* follows in second place ($\beta = 0.28$; $t = 2.05$; $p = 0.04$). As with the subsample of female students, the organization, presentation of content and implementation of this part of the lesson requires, technically and content-wise, well-articulated communication in order to successfully describe and clarify the teaching content. Kinesiology students whose communication is comprehensible, syntactically appropriate and logically meaningful are also more successful in the actual implementation of the main A lesson part. The variable *Assertiveness and formality dimension (AFD)* also make a significant contribution to the regression model ($\beta = 0.24$; $t = 2.29$; $p = 0.03$). It is possible to conclude that, considering the level of organizational, content and implementation complexity, the successful implementation of the main A lesson part requires a certain degree of authoritarianism, determination in expressing one's own views, as well as positional fixity, i.e. communication asymmetry (Babin et al., 2013; T. Bavčević et al., 2018).

The quality of the implementation of the main B lesson part is significantly dependent on the manifestations of the interpersonal communication process dimensions in both subsamples of respondents ($R_{\text{female}} = 0.688$; $F_{\text{female}} = 15.300$; $p_{\text{female}} < 0.001$; $R_{\text{male}} = 0.651$; $F_{\text{male}} = 14.994$; $p_{\text{male}} < 0.001$).

The partial contribution analysis indicated a significant contribution of the variable *Technical and content communication dimension (TCD)* to the significance of the regression model both in the subsample of female students ($\beta = 0.48$; $t = 2.66$; $p = 0.01$) and in the sample male students ($\beta = 0.46$; $t = 2.66$; $p = 0.01$). The obtained findings point to the conclusion that technically and qualitatively articulated communication significantly contributes to the quality of the implementation of the main B lesson. Since the main B lesson part, in addition to high organizational requirements, is also characterized

by the application of complex content and the necessity of constant control of the implementation, communication qualities such as clarity, comprehensibility, syntactic appropriateness and logical meaningfulness are necessary prerequisites for the quality implementation of this part of the lesson (T. Bavčević, 2016; T. Bavčević et al., 2018). Both female and male students of kinesiology who achieve higher results in the variable *Technical and content communication dimension (TCD)*, transfer information to students more easily and efficiently in this part of the PE lesson.

The quality of the implementation of the closing lesson part is significantly dependent on the manifestations of the interpersonal communication dimensions in both subsamples of respondents ($R_{\text{female}} = 0.666$; $F_{\text{female}} = 13.528$; $p_{\text{female}} < 0.001$; $R_{\text{male}} = 0.494$; $F_{\text{male}} = 6.552$; $p_{\text{male}} = 0.001$).

Analysis of the partial influence in the subsample of female students indicated a statistically significant contribution of the variable *Technical and content communication dimension (TCD)* to the significance of the regression model ($\beta = 0.53$; $t = 2.91$; $p = 0.01$). It is possible to conclude that technically and substantively articulated communication significantly contributes to the quality of the implementation of the closing lesson part. Considering the organizational, content and implementation specifics, this part of the lesson as one of the most important factors of successful implementation requires a quality description and clarification of the content (Findak et al., 2011). Therefore, it is understandable that kinesiology students who manage to achieve clear, comprehensible, syntactically appropriate and logically meaningful communication ultimately achieve better effects in this part of the lesson.

In the subsample of male students, no statistically significant influence of any of the three variables of the interpersonal communication process on the significance of the regression model was recorded. The findings point to the conclusion that, despite the dependence on the global level, none of the dimensions of interpersonal communication by itself significantly affect the implementation quality of the closing lesson part. We can support the conclusions with the findings of other studies (Ariyani & Hadiani, 2019; T. Bavčević, 2016; Findak et al., 2011; Kilby, 2023; Krahe et al., 2021).

CONCLUSION

The process of communication appears as an important factor in all aspects of teaching work and represents a significant factor in the quality of the education process as a whole. Investigating the role of communication in the teaching process, three main discursive roles of communication were identified: imparting knowledge to students, teaching students with the aim of improving their achievements, and providing support to students in the learning process (Oh, 2005). Previous research also highlights the importance of communication in improving students' motivation for active participation in classes and maintaining a positive teaching environment (Brown, 2005). Communication appears as one of the crucial factors in the management of the teaching process (Reese, 2007). Furthermore, study highlights the importance of teaching communication as a significant factor in preventing problems in teaching (Pedota, 2007).

The importance of quality communication as a significant determinant of a successful education process is evident from all of the above. Therefore, it is recommended to implement these findings into immediate teaching practice through the improvement of university curricula for future teachers, as well as through lifelong education intended for teachers. The main goal of such activities would be to raise awareness among teachers about the importance of communication skills in working with students and thereby to improve the general quality of the educational process.

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